

The Institute for Bird Populations

Demographic Monitoring on Military Lands: Scales of Uncertainty

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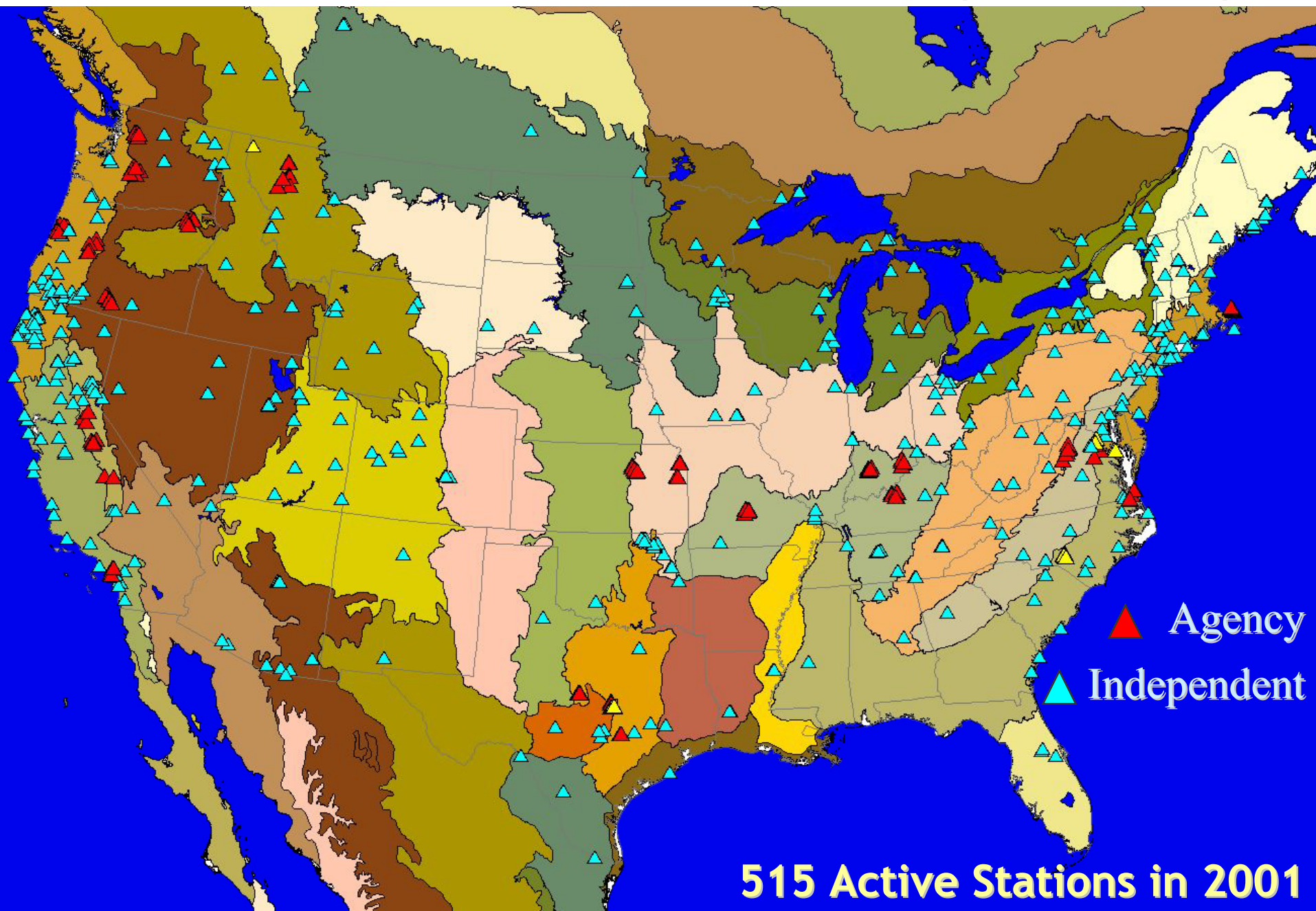
L E G A C Y

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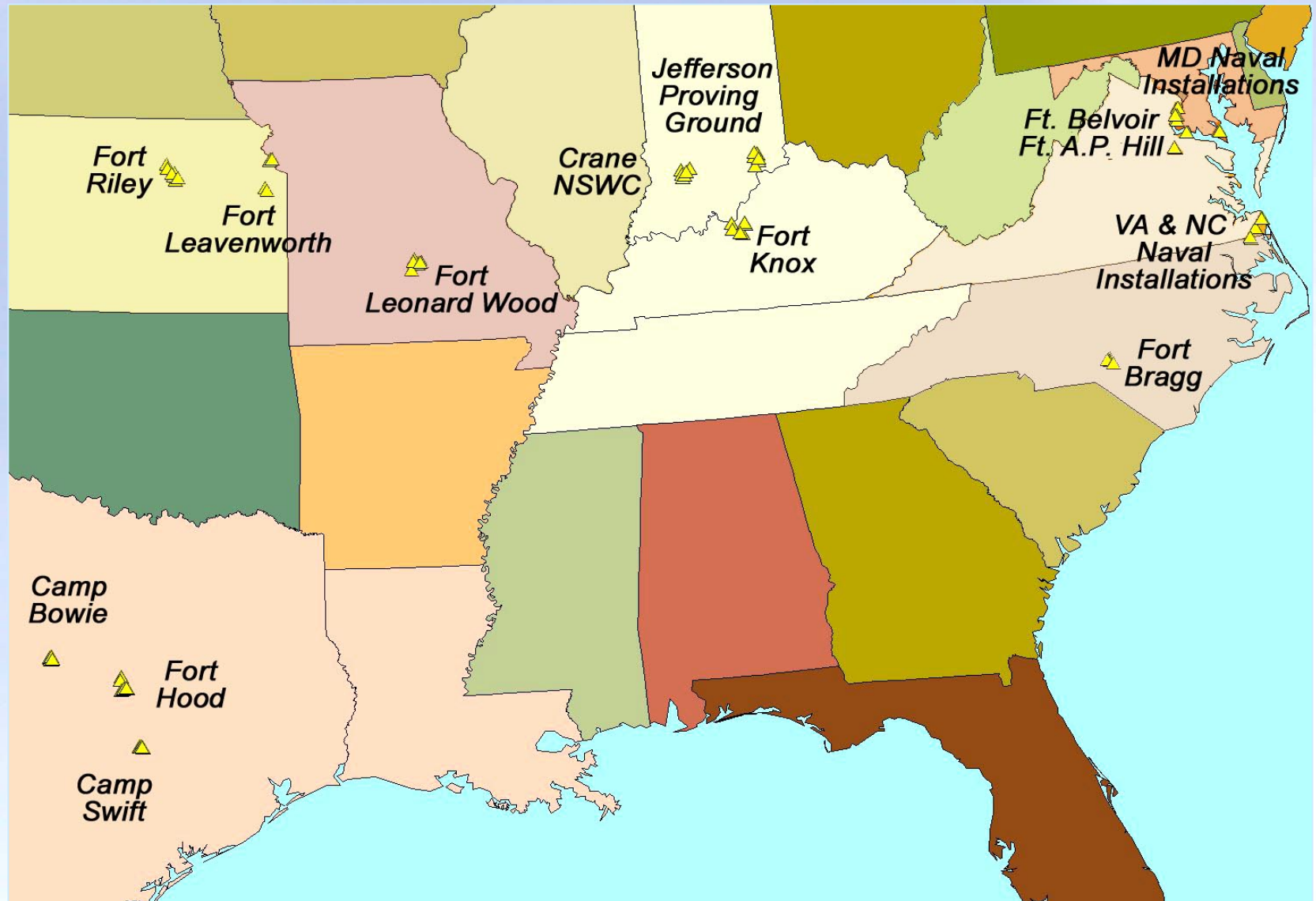
Introduction

- Since 1992 the MAPS program has conducted avian demographic monitoring on military installations.
 - 78 stations on 13 installations (DoD Legacy network)
- Related demographic data to patterns of weather/climate and landscape to model population variability.
 - Patterns affect both survival and reproductive success
- Constructed species-landscape (NLCD) models for a suite of 10 FWS Birds of Conservation Concern
 - Total of 31 species effectively monitored
- Provided management recommendations and decision-support tools for avian conservation management plans.
 - Conducting effectiveness and control monitoring of one or more BCC species using 48 stations on 8 installations

Distribution of MAPS stations (lower 48)



MAPS Locations on Military Installations



Species of Management Concern by Installation

[illegible]

Birds of Conservation Concern at Ft. Leonard Wood

| Neotropical wintering | | Temperate wintering | |
|-----------------------------|------------------------------|--------------------------|-----------------------------|
| Increasing | Decreasing | Increasing | Decreasing |
| <i>White-eyed Vireo</i> | Acadian Flycatcher * | <i>Northern Cardinal</i> | Downy Woodpecker |
| Red-eyed Vireo | Black & white Warbler | | Carolina Chickadee |
| Blue-gray Gnatcatcher | Worm-eating Warbler | | Tufted Titmouse |
| Wood Thrush * | Ovenbird | | <i>Carolina Wren</i> |
| <i>Blue-winged Warbler</i> | Louisiana Waterthrush | | <i>Field Sparrow</i> |
| <i>Prairie Warbler *</i> | Kentucky Warbler | | |
| <i>Yellow-breasted Chat</i> | <i>Common Yellowthroat</i> | | |
| <i>Indigo Bunting</i> | | | |

- 21 landbird species are effectively monitored on FLW by MAPS
- 8 FWS Birds of Conservation Concern are effectively monitored
 - includes 5 forest and 3 successional BCC species
- Five species are declining locally: Neotropical (4), Temperate (1)
- Three successional species of particular management concern

Adult Population Trends by Station

| Species | BIPI | LABO | MIPO | MACE | SMRI | MIRI |
|----------|--------|-----------------|--------|-----------------|-------|-------|
| ACFL | -2.25 | ** -11.8 | | | | |
| WOTH | *15.8 | | | | | |
| WEWA | -2.4 | | | | | |
| LOWA | -3.7 | | | | | |
| KEWA | 1.0 | 4.0 | 5.8 | | | -22.6 |
| BWWA | -5.0 | 3.1 | 5.1 | | | |
| PRAW | | 14.3 | *14.7 | | | |
| FISP | | -3.9 | 5.8 | ** -32.5 | | |
| N(#neg.) | 12 (7) | 16 (9) | 14 (4) | 6 (5) | 2 (0) | 3 (2) |

- Forest/woodland species except WOTH declining at Big Piney
- Acadian Flycatcher declining at Laughlin Bottom
- Macedonia site becoming unattractive to field sparrows
- Two upland mature forest stations unsuitable for MAPS monitoring

Field Sparrow - Landscape Model

| Variables | | | | | | | | | | | q | Rsqr | Lackoffit | AIC | ICOMP | ICOMPIFIM |
|-----------|---|---|---|---|---|---|---|---|----|---|--------|---------|-----------|--------|--------|-----------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | | | | | | |
| 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 3 | +0.621 | -12.317 | -4.317 | -8.552 | -1.671 | |
| 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 4 | +0.621 | -12.327 | -2.327 | -8.445 | -0.392 | |
| 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 4 | +0.621 | -12.330 | -2.330 | -8.072 | +0.538 | |
| 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 4 | +0.621 | -12.317 | -2.317 | -8.070 | +0.080 | |
| 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 5 | +0.622 | -12.337 | -0.337 | -7.266 | +1.762 | |
| 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 5 | +0.622 | -12.340 | -0.340 | -6.660 | +0.714 | |
| 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 3 | +0.623 | -12.416 | -4.416 | -6.045 | -2.854 | |
| 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 4 | +0.619 | -12.211 | -2.211 | -5.841 | -4.096 | |
| 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | +0.462 | -6.720 | -0.720 | -5.783 | +3.454 | |
| 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 4 | +0.627 | -12.549 | -2.549 | -5.752 | -1.594 | |

Selected model regression coefficients

Dependent variable : FISP (RImean)

FOREST %Cover 0.0049

GRASS Core Area 0.0030

AGRI Edge (m/ha) -0.0049

Rsqr = 0.631 F = 10.823 P = 0.002

ICOMP

Bozdogan's index of information complexity penalizes models for :

- overparameterization
- covariance and colinearity among "independent variables"

Field Sparrow - Landscape Model

| Cover Classification | Classification Attribute | Proportional Contribution |
|----------------------|--------------------------|---------------------------|
| 2 : SHRUB | %Cover | 0.08 |
| 3 : FOREST | %Cover | 0.26 |
| 4 : FOREST | Core Area | 0.00 |
| 5 : GRASS | %Cover | 0.03 |
| 6 : GRASS | Core Area | 0.24 |
| 7 : GRASS | Edge (m/ha) | 0.11 |
| 8 : AGRI | %Cover | 0.08 |
| 9 : AGRI | Edge (m/ha) | 0.16 |
| 10 : FOREST | Edge (m/ha) | 0.05 |

MACEDONIA MAPS Station

Fort Leonard Wood, MO

● Net Locations

Station Boundary

NVCS: IIB2Na12

NVCS: VA7Ng

3 year burn cycle

100m

MAPS Habitat Structure Assessment

Upperstory 40%:

Quercus rubra

Midstory 80%:

Gleditsia triacanthos

Juniperus virginiana

Understory 30%:

Cornus alternifolia

Sassafras albidum

Midstory <5%:

Quercus stellata

Gleditsia triacanthos

Understory 30%:

Juniperus virginiana

Gleditsia triacanthos

Ground cover 85%:

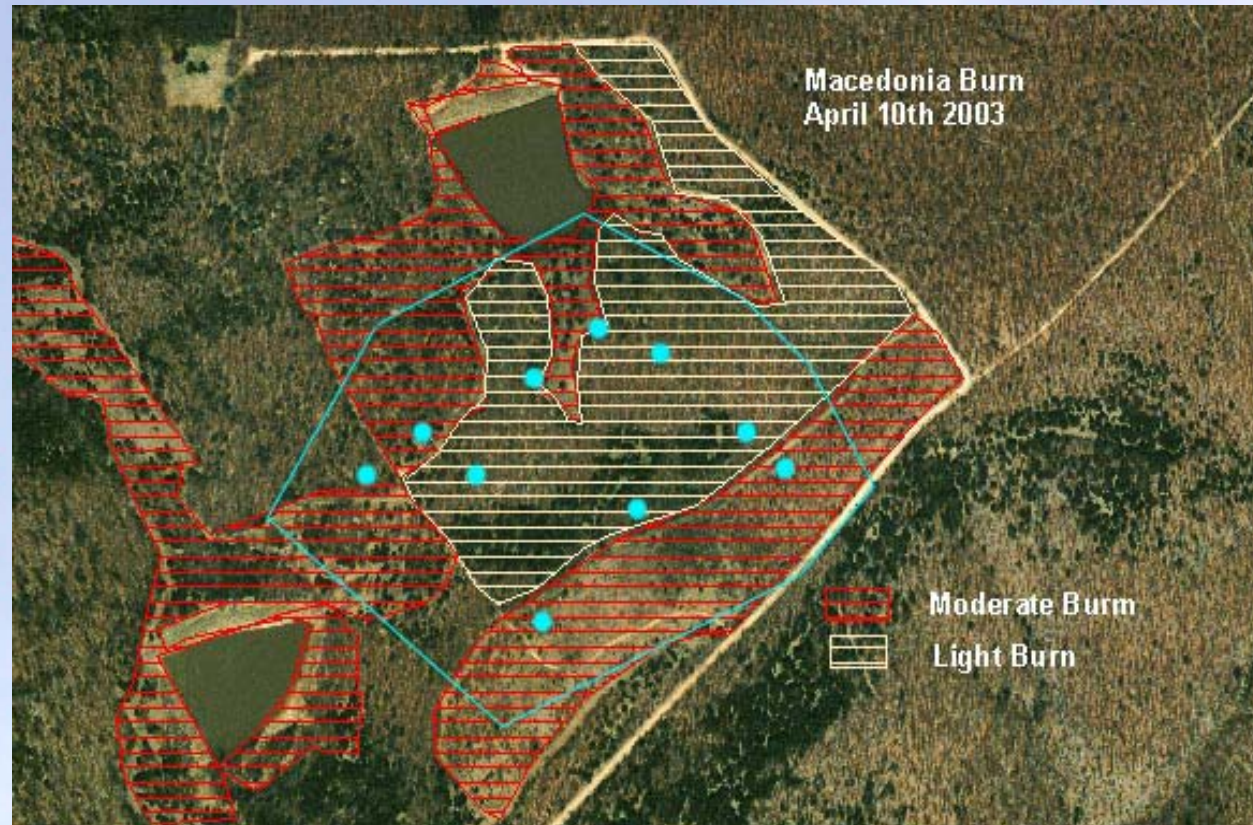
Daucus carota

Aster spp.

Managing for Field Sparrow in 2003

Extensive springtime fire management of Macedonia area will reduce fire risk from training exercises and produce “disclimax” plant community that is preferred by field sparrows

Attracted migrating LOWA and WOTH, a breeding BGGN (3), and NOPA juvenile



Long term burning of this frequency can produce a community more typical of pre-settlement oak savannah habitat common in this region

Managing Plant Communities with Fire

Spring burn at FLW intended to promote subsequent growth of warm-season grasses :

little bluestem, big bluestem, switch grass, Indian grass and broomsedge

Forb species are also present :

goldenrod, brown-eyed susan, asters, and desmodium



*Resetting an oldfield community
at Fort Leonard Wood in 2001*

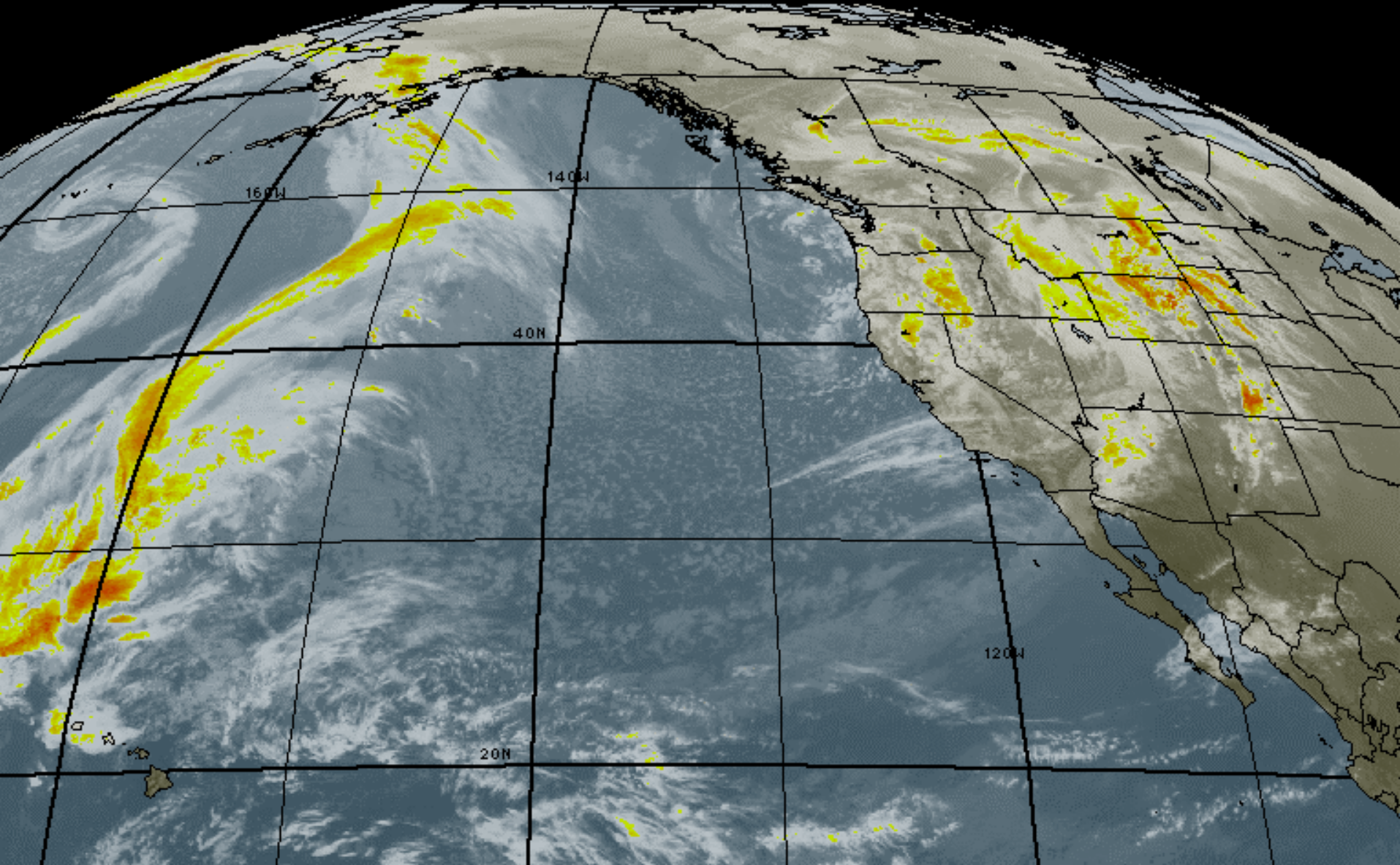
Management associated with military range sustainment can produce a mosaic of different aged old field (disclimax) communities that provide suitable breeding habitat for many birds of conservation concern

Scales of Uncertainty

- Continental – climate can cause major affects
 - Individual fitness and reproductive potential
 - Phenological variation – timing of migration, arrival and nesting
- Regional – landscape and environmental change
 - Shifting agricultural practices and development
 - Shifting seasonal weather patterns
- Local – land use change and management
 - Adjacent land use not controlled by DoD
 - Managing for military readiness and range sustainment
- Stochastic events – processes lacking predictable scale
 - Disease, pollution, and pest outbreaks
 - Invasive plants and geographic range shift

Climate, Weather, and PNW Bird Populations

23:30 26-FEB-2004 GMT ©Copyright MSI Corporation <http://www.wsi.com>



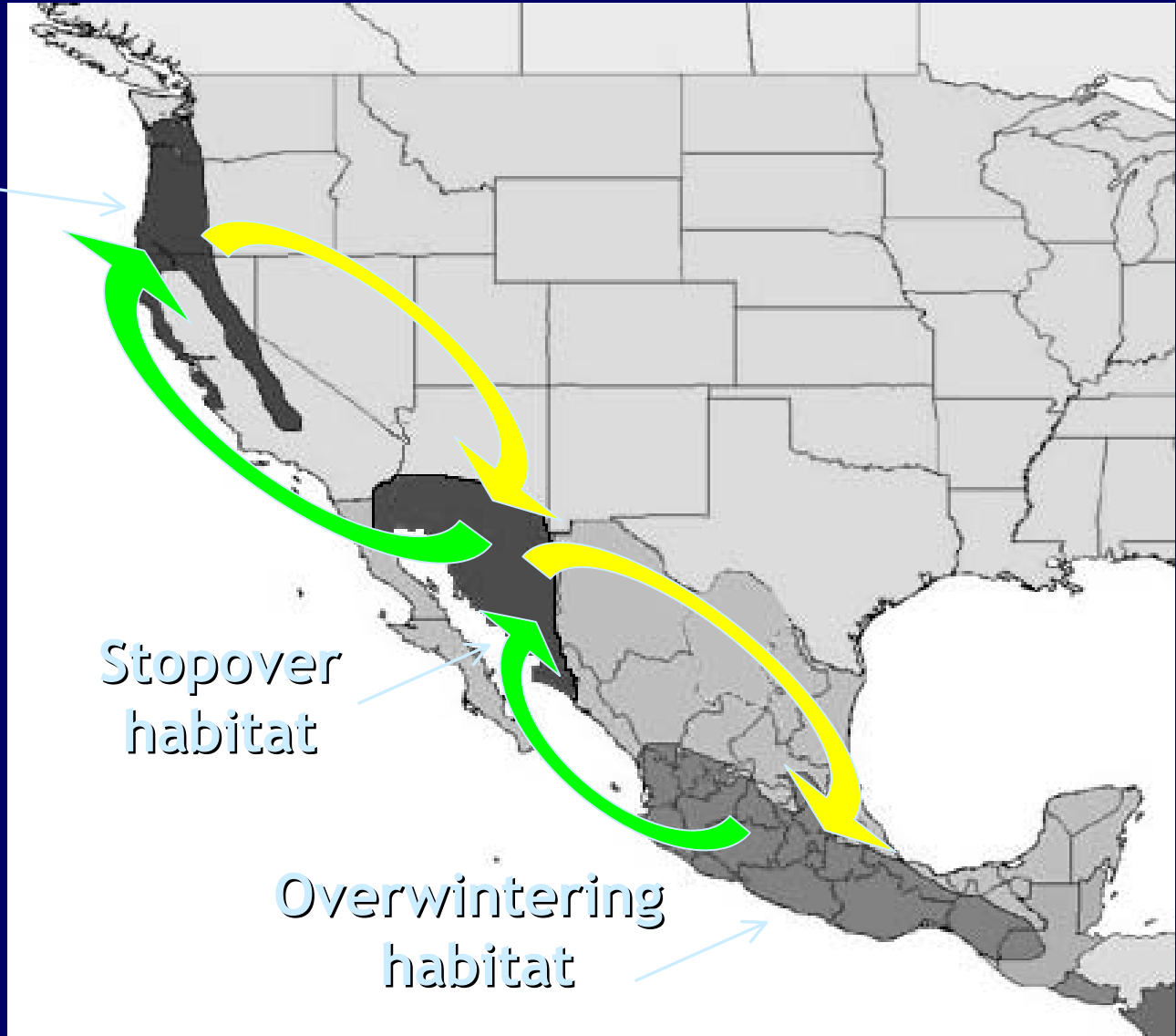
Hermit warbler range dynamics

Breeding
habitat

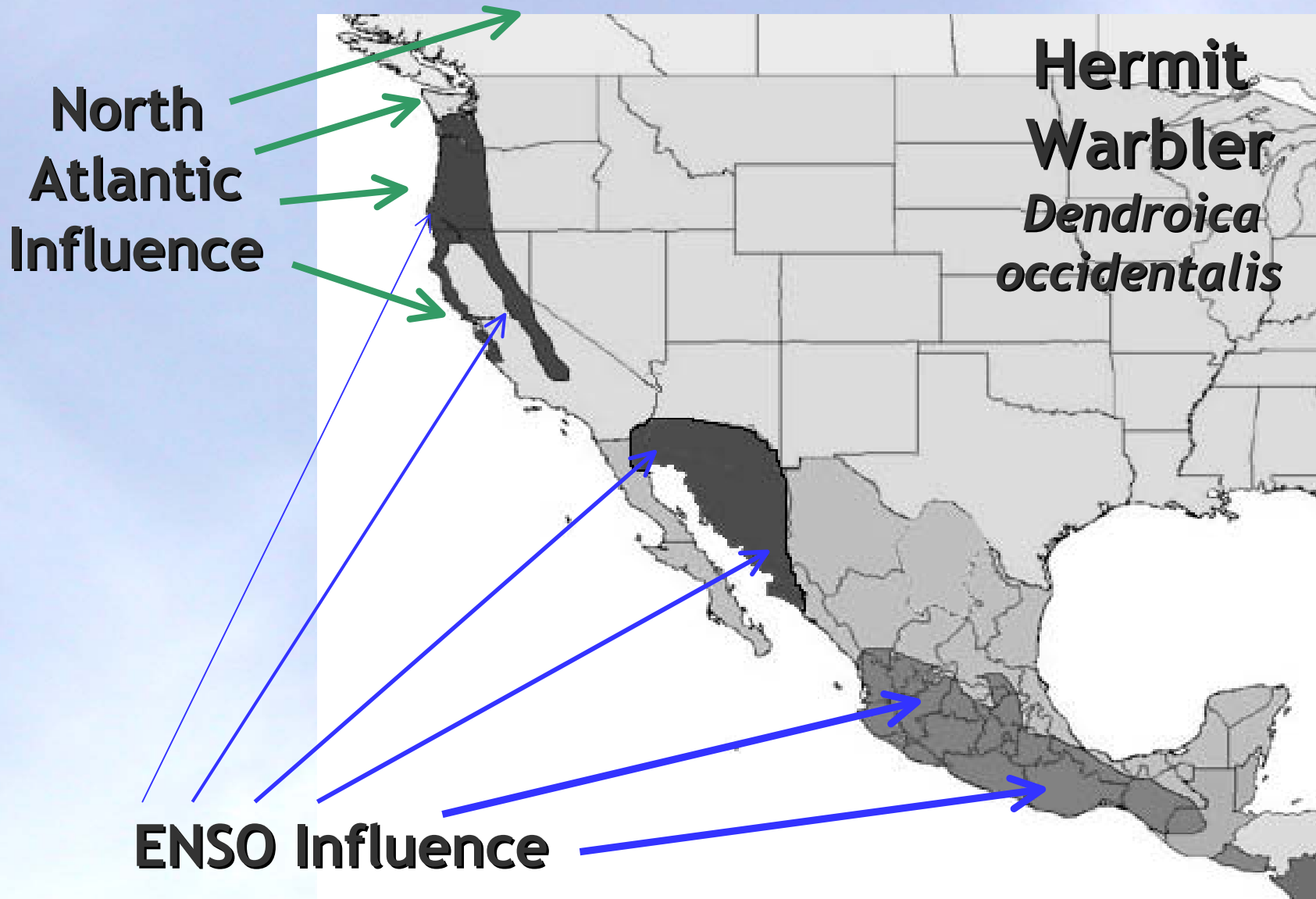
Hermit
Warbler
*Dendroica
occidentalis*

Stopover
habitat

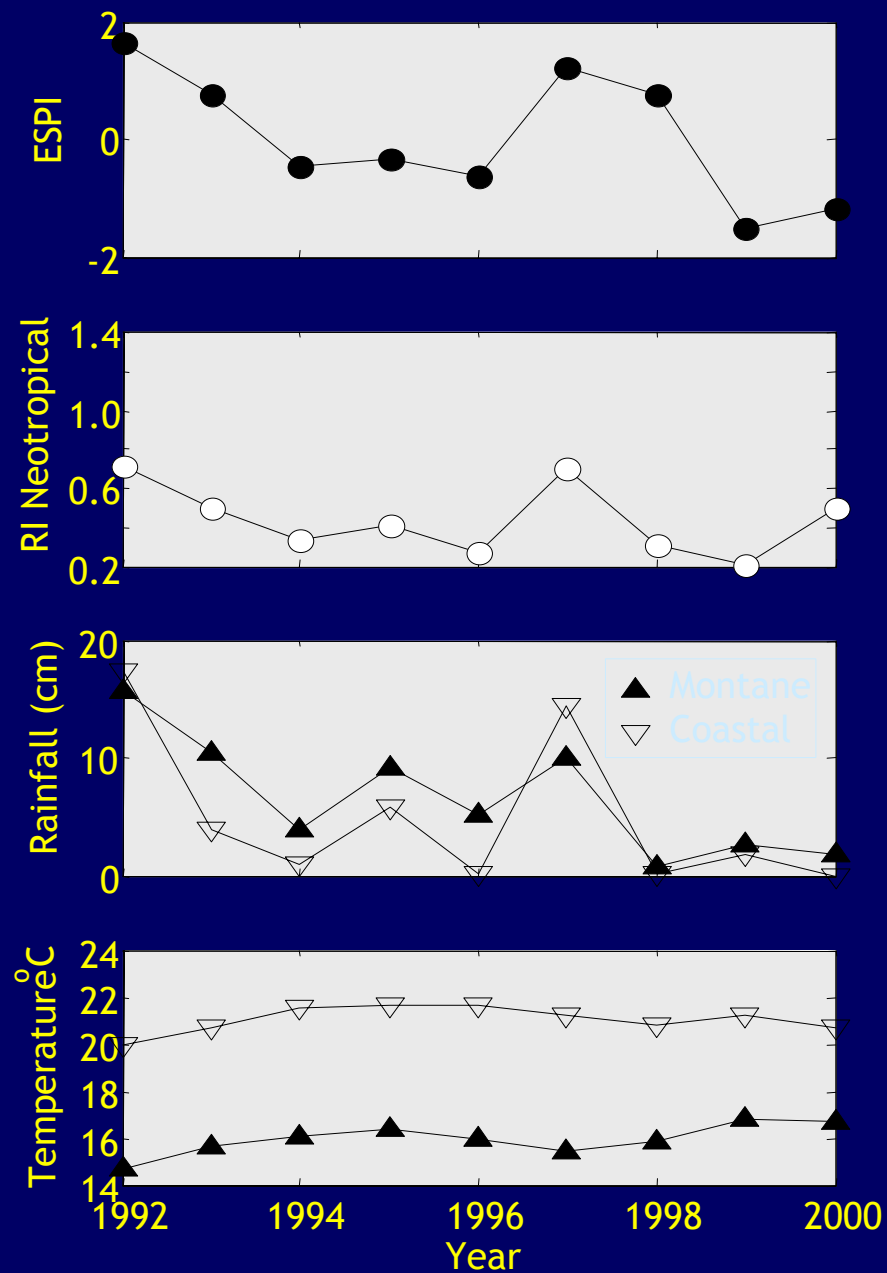
Overwintering
habitat



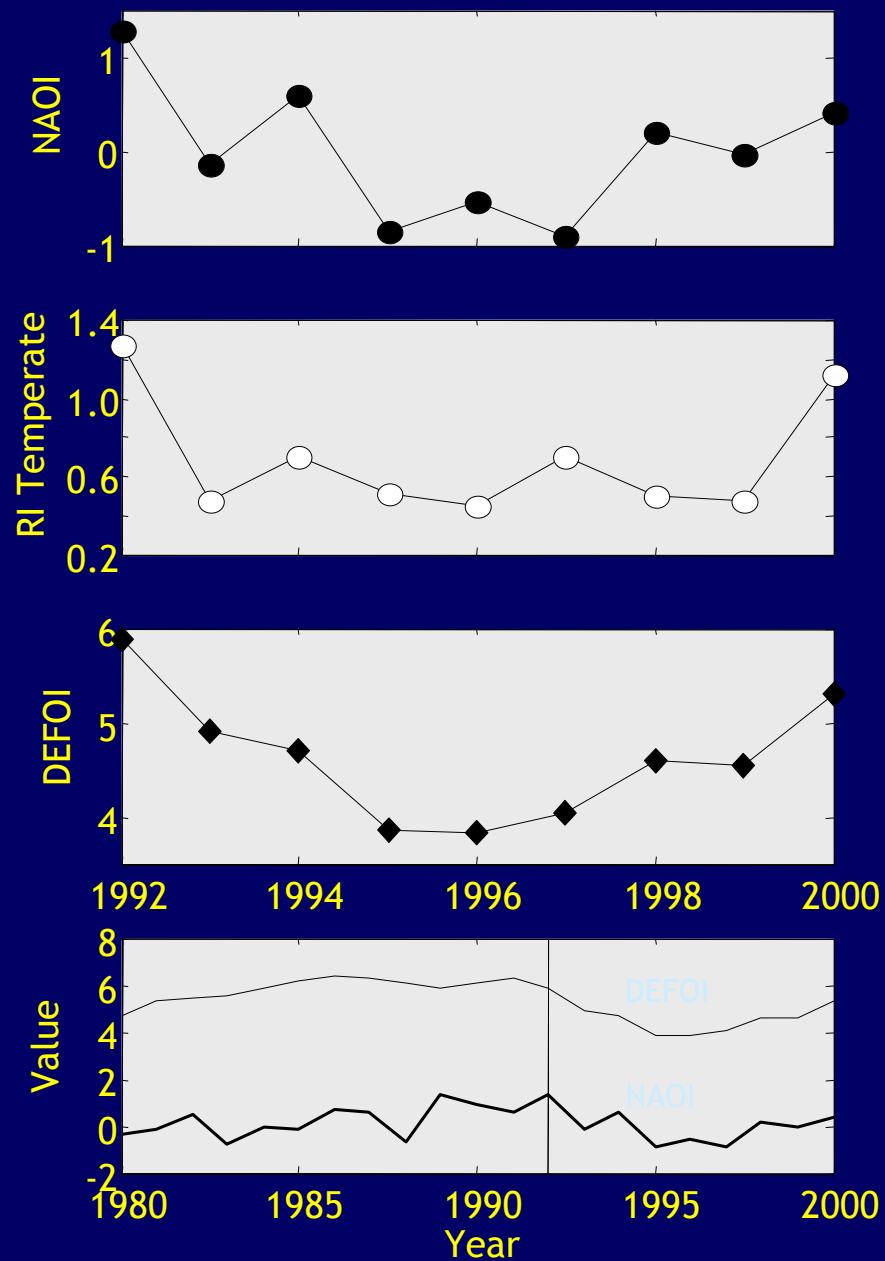
Oceanic influences on Neotropical migrants



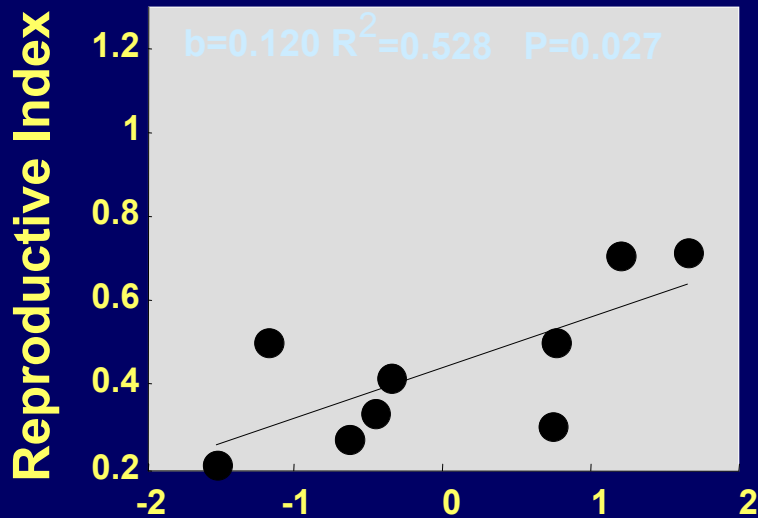
Neotropical Wintering Species



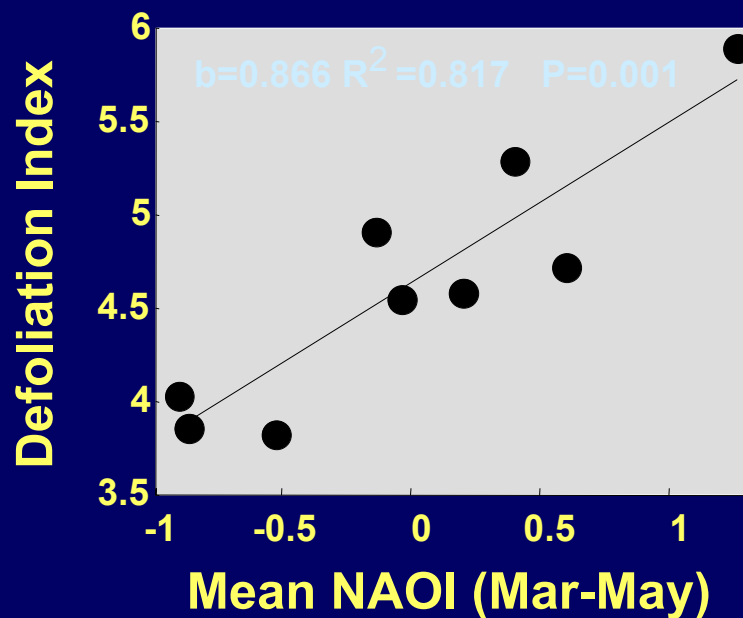
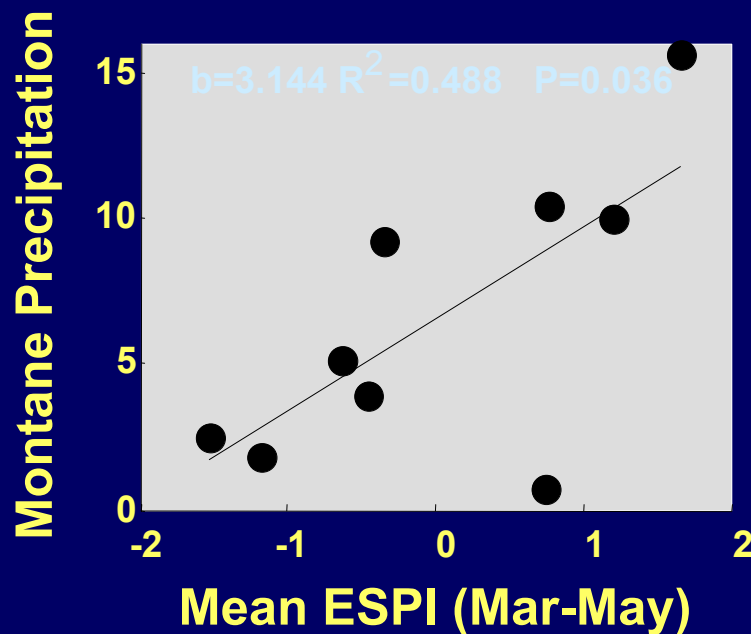
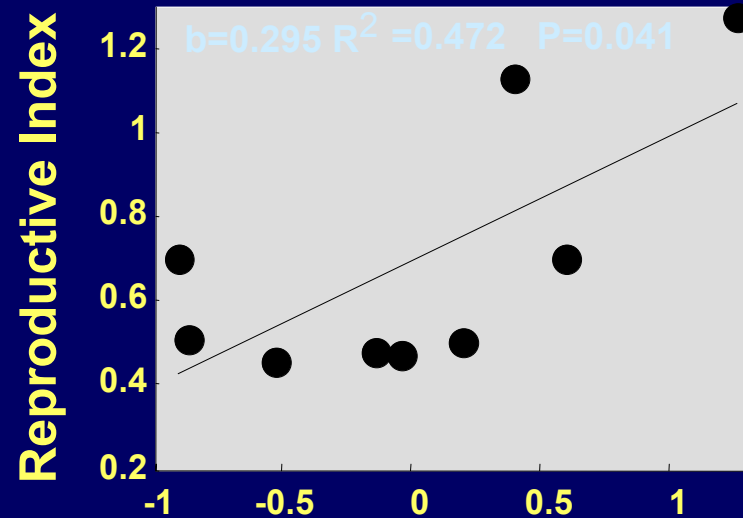
Temperate Wintering Species



Neotropical Migrants



Temperate Migrants

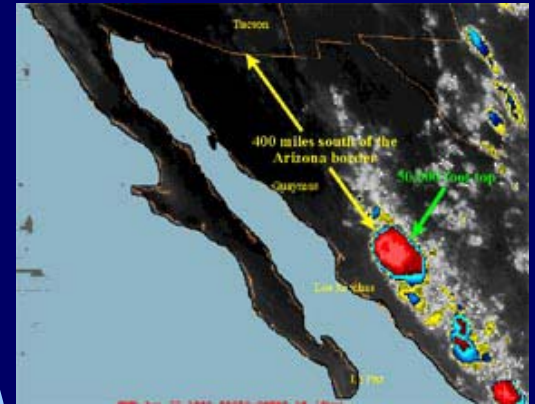


Warm-phase ENSO (El Niño)



More fledglings
in Pacific Northwest

*Effects of ENSO
on species that
overwinter in the
Neotropics*



Higher late winter
rainfall on wintering
ranges in west Mexico

Birds migrate
earlier, and/or
arrive in better
physiological
condition ?



More food resources or less stress
for pre-migration conditioning ?

Warm-phase NAO (NAO+)



More fledglings
in Pacific Northwest

*Effects of NAO
on species that
overwinter in the
Temperate zone*



Warmer and drier
springtime in the
Pacific Northwest

Birds in better
physiological
condition due to
more available
food resources

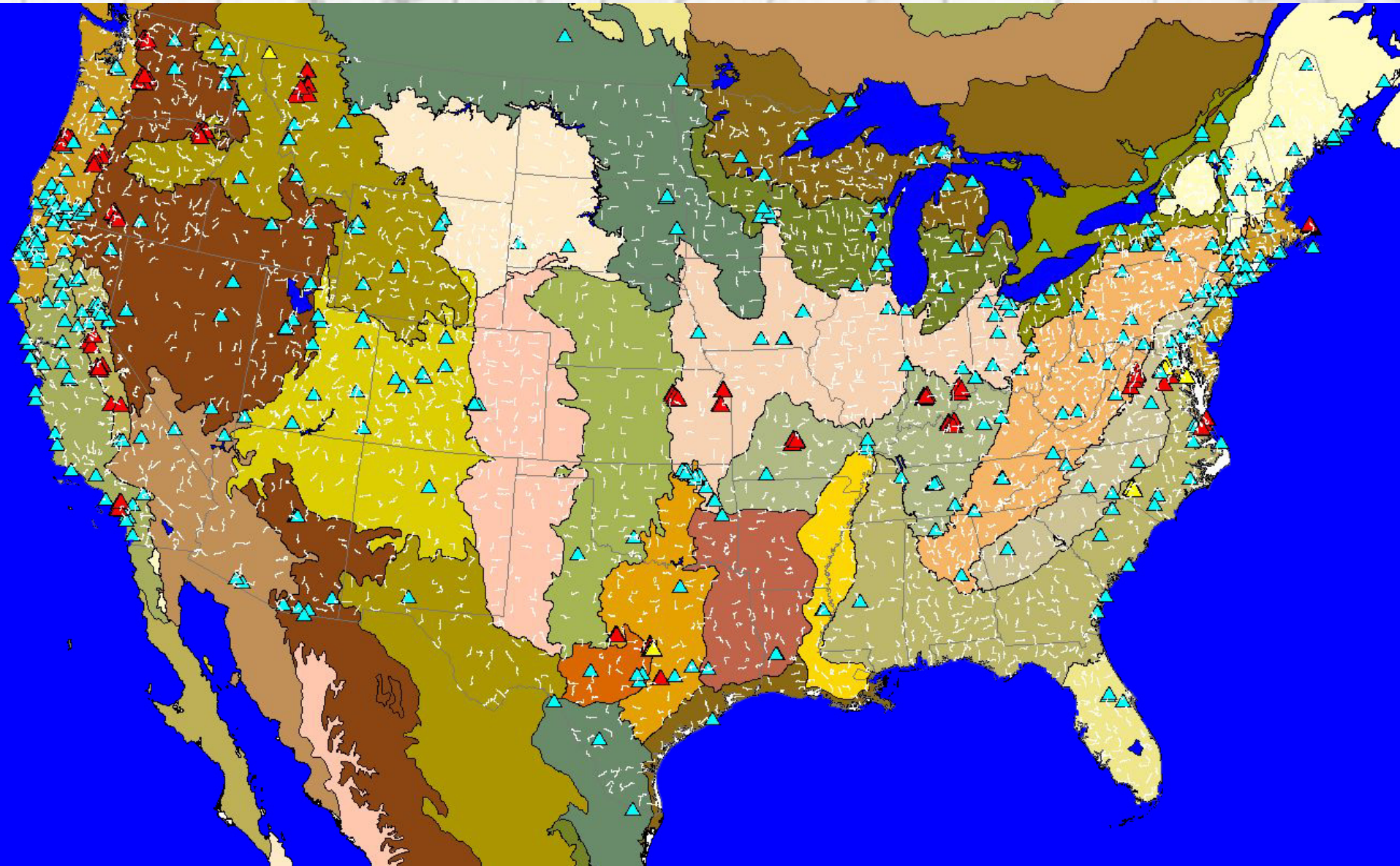


Conditions
give rise to
more larvae
for food

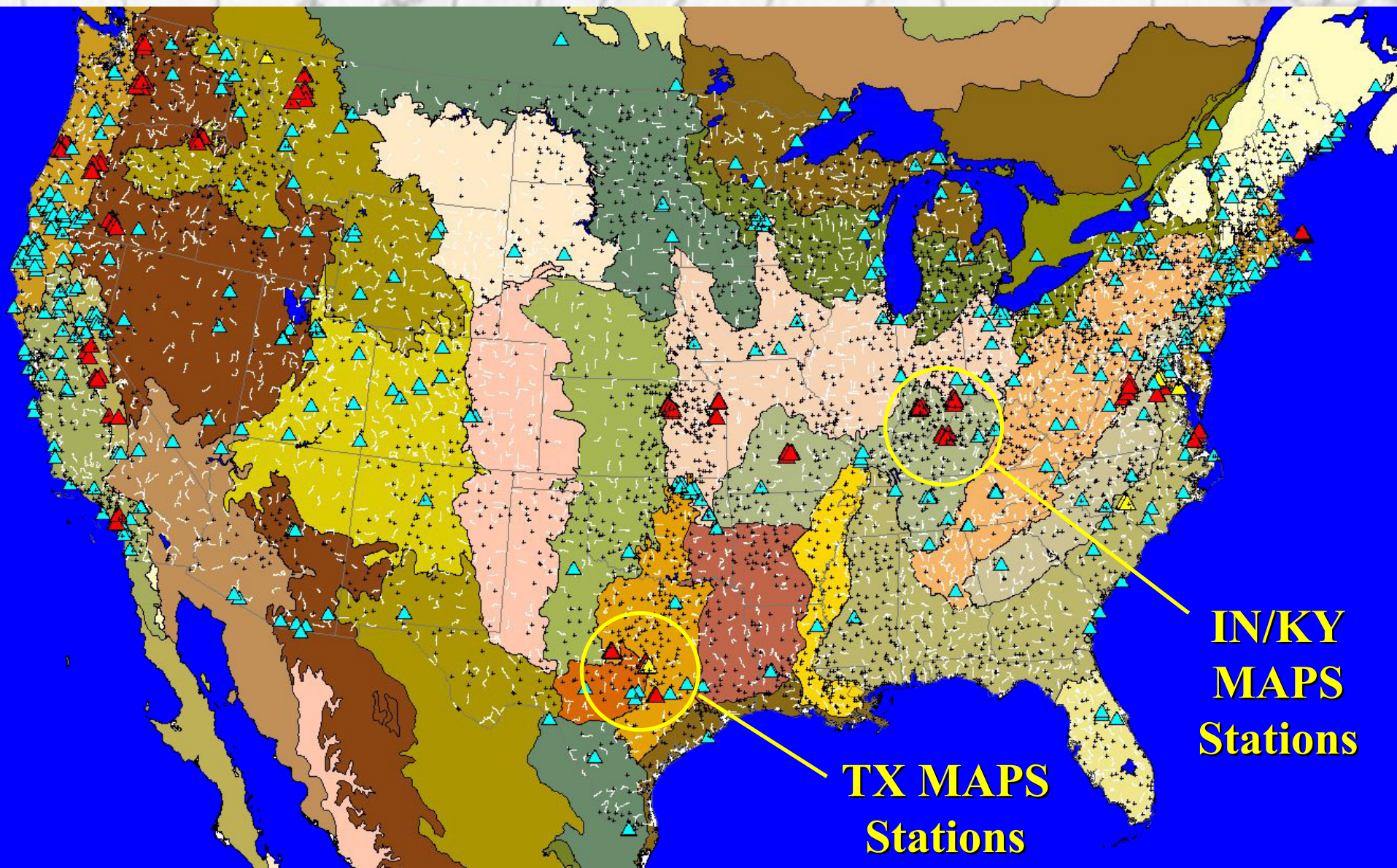
Integrated Monitoring

- Bird monitoring - Breeding Bird Survey of adult abundances can indicate declines
- Weather and climate - various databases available
 - *NOAA Cooperative weather monitoring database*
 - *GPCP historical gridded model*
- Land cover - various databases available
 - *NLCD 1992* *NLCD 2000 ?????*
 - *IKONOS 4m resolution stereo multispectral*
- Habitat condition - seasonal greenness indices from AVHRR and other satellite datasets

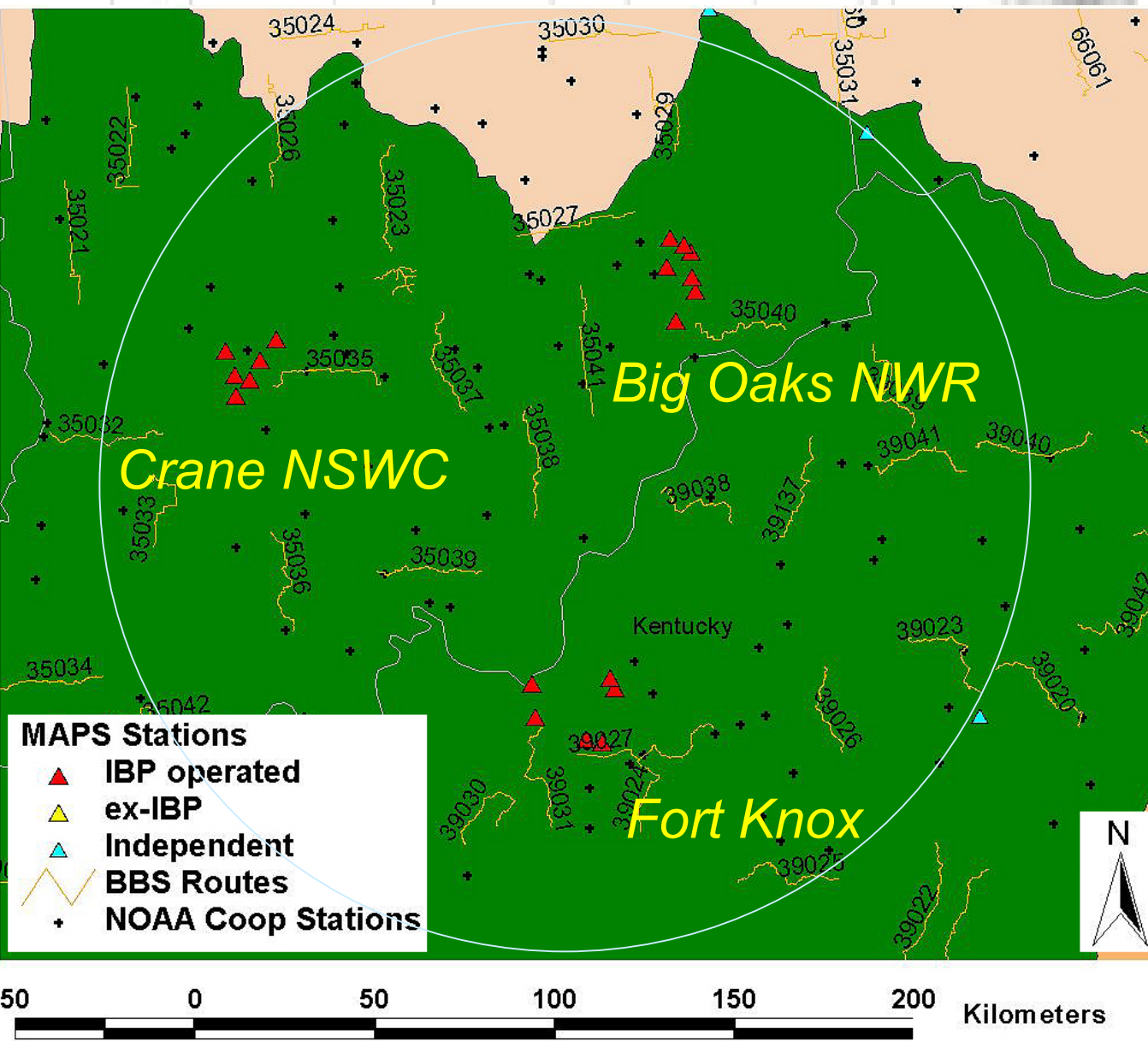
... including BBS routes



... and NOAA Cooperative Stations

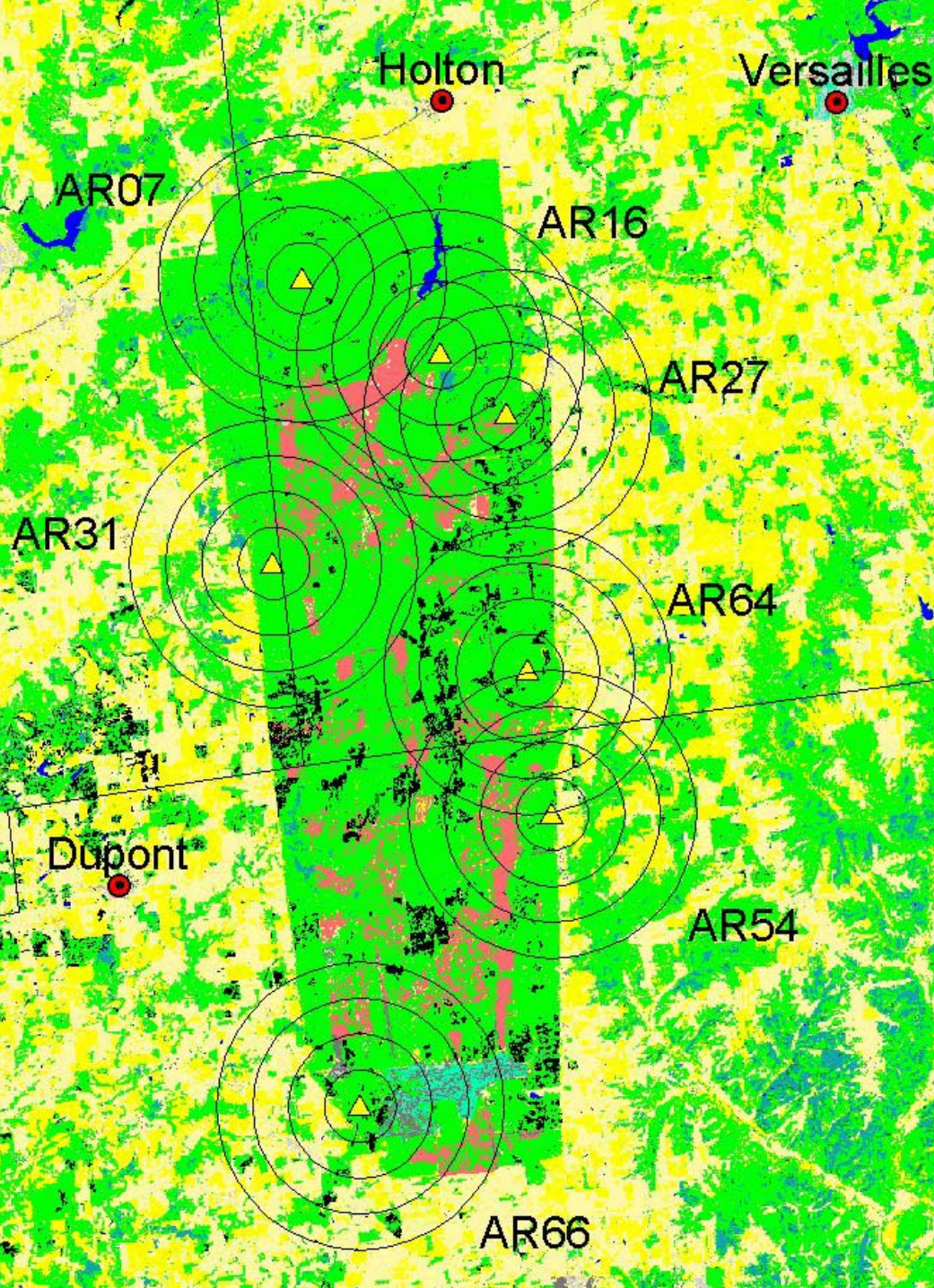


Locations of IN/KY MAPS Stations within NABCI Region #24 (Central Hardwood)



Incorporated
within a 50,000km²
area of NABCI
Region #24 are:

18 MAPS stations
24 BBS routes and
75 NOAA stations

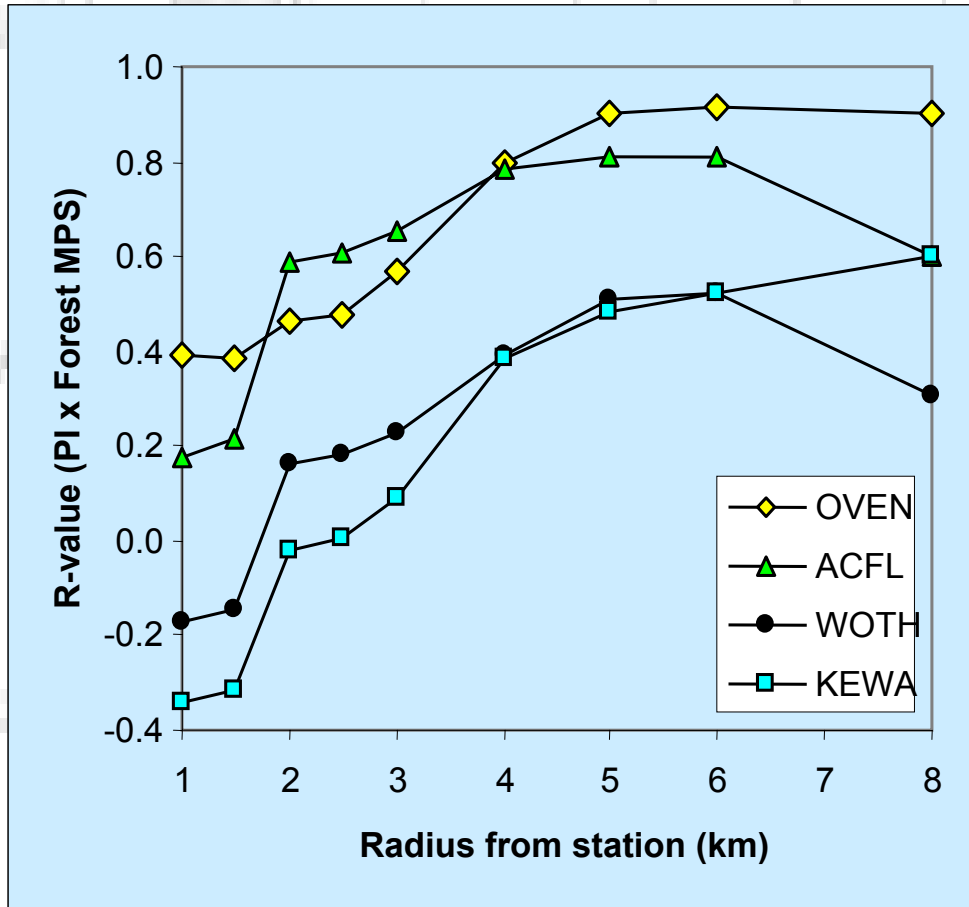


National Land Cover Dataset (NLCD) coverage for Big Oaks National Wildlife Refuge, IN depicting 1- 4km buffers

NLCD Classification

| | |
|---|--------------------------------|
|  | Open water |
|  | Perennial Ice/Snow |
|  | Residential (Low Intensity) |
|  | Residential (Medium Intensity) |
|  | Residential (High Intensity) |
|  | Bare Rock/Sand/Clay |
|  | Quarries/Mines/Pits |
|  | Transitional |
|  | Deciduous Forest |
|  | Evergreen Forest |
|  | Mixed Forest |
|  | Shrubland |
|  | Orchards/Vineyards |
|  | Grassland/Herbaceous |
|  | Pasture/Hay |
|  | Row Crops |
|  | Small Grains |
|  | Urban/Recreational Grasses |
|  | Woody Wetlands |
|  | Herbaceous Wetlands |

Scale of response



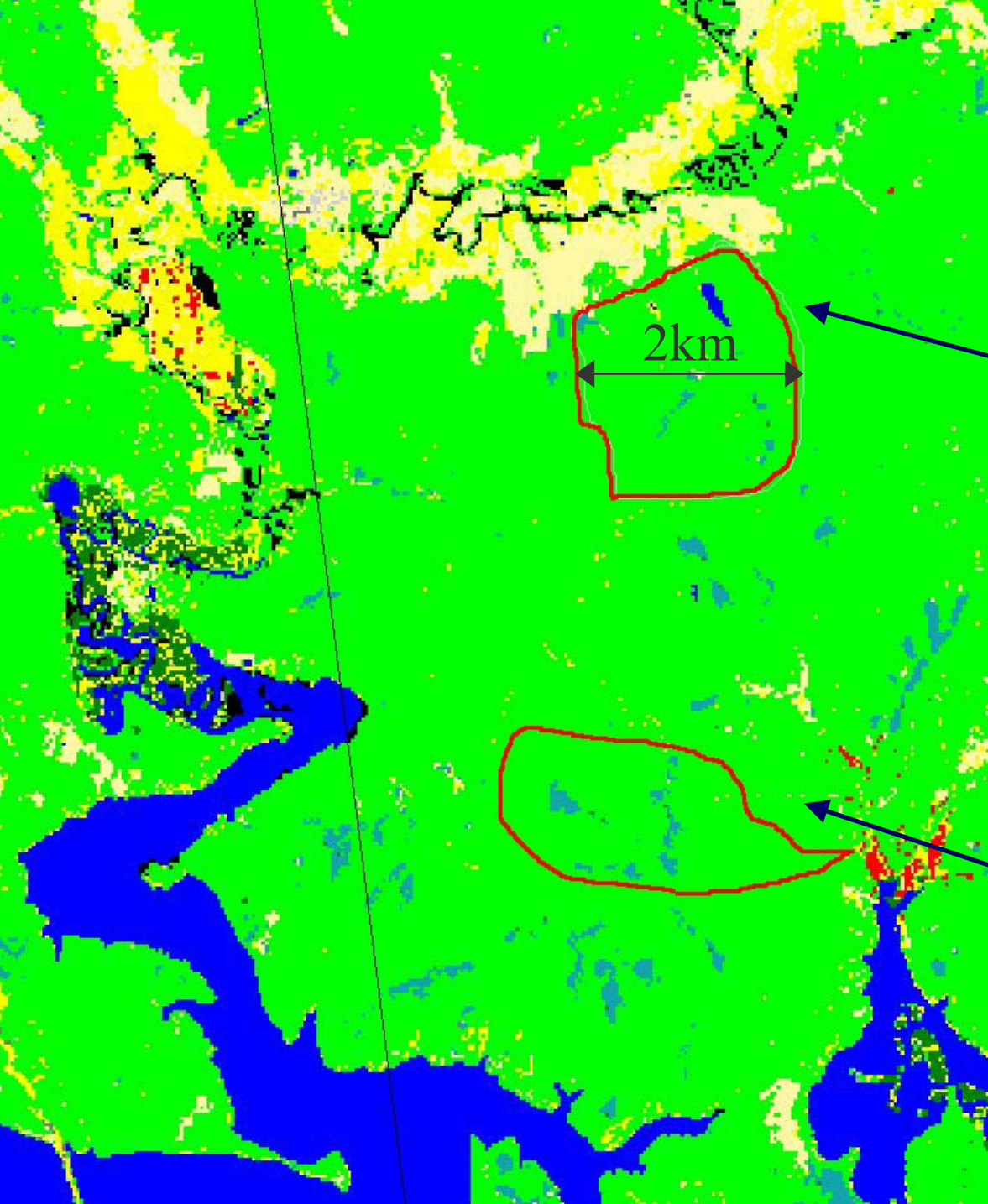
Correlations strengthen as a function of radius from the station

Overall strengths of relationships vary among species

Response curves similar among stations

Landscape Determinants for 9 Species

| SPECIES | ADULTS | | | YOUNG | | |
|---|--------|----------|--------|-------------|----------|----------|
| | METRIC | <i>r</i> | P | METRIC | <i>r</i> | <i>P</i> |
| <u><i>Forest interior species</i></u> | | | | | | |
| Ovenbird | WMPS | 0.92 | <0.01 | WMPS | 0.97 | <0.01 |
| Acadian Flycatcher | WMPS | 0.99 | <0.001 | WMPS | 0.98 | <0.001 |
| Wood Thrush | WMPS | 0.86 | <0.05 | WMPS | 0.86 | <0.05 |
| Kentucky Warbler | WMPS | 0.88 | <0.05 | Crop/Grass% | -0.94 | <0.01 |
| <u><i>Edge/successional species</i></u> | | | | | | |
| Northern Cardinal | DEVEL% | 0.88 | <0.05 | WOFOMNN | -0.84 | <0.05 |
| Gray Catbird | WFEDGE | 0.92 | <0.01 | DEVEL% | 0.96 | <0.005 |
| White-eyed Vireo | WFEDGE | 0.96 | <0.005 | WFEDGE | 0.80 | <0.10 |
| Indigo Bunting | WFEDGE | 0.79 | <0.10 | TRAN% | 0.83 | <0.05 |
| Common Yellowthroat | WFEDGE | 0.96 | <0.005 | WFEDGE | 0.96 | <0.005 |



National Land Cover Dataset (NLCD) coverage for depicting study areas of Thomas Ford et al. 2001 in south-central Indiana

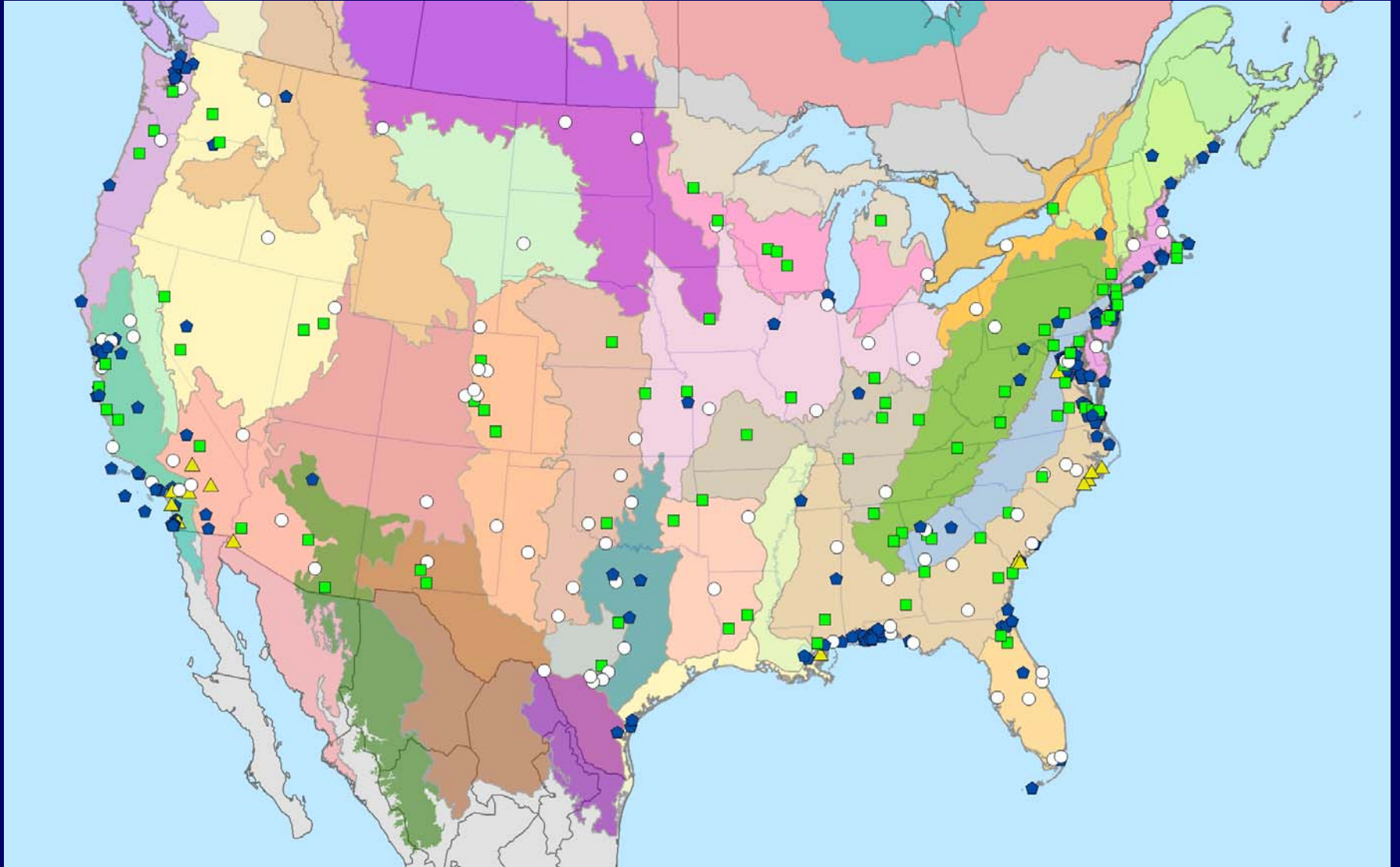
Forested study site is proximal to agricultural corridor and associated with:

Higher cowbird parasitism and fewer fledglings per nesting attempt than

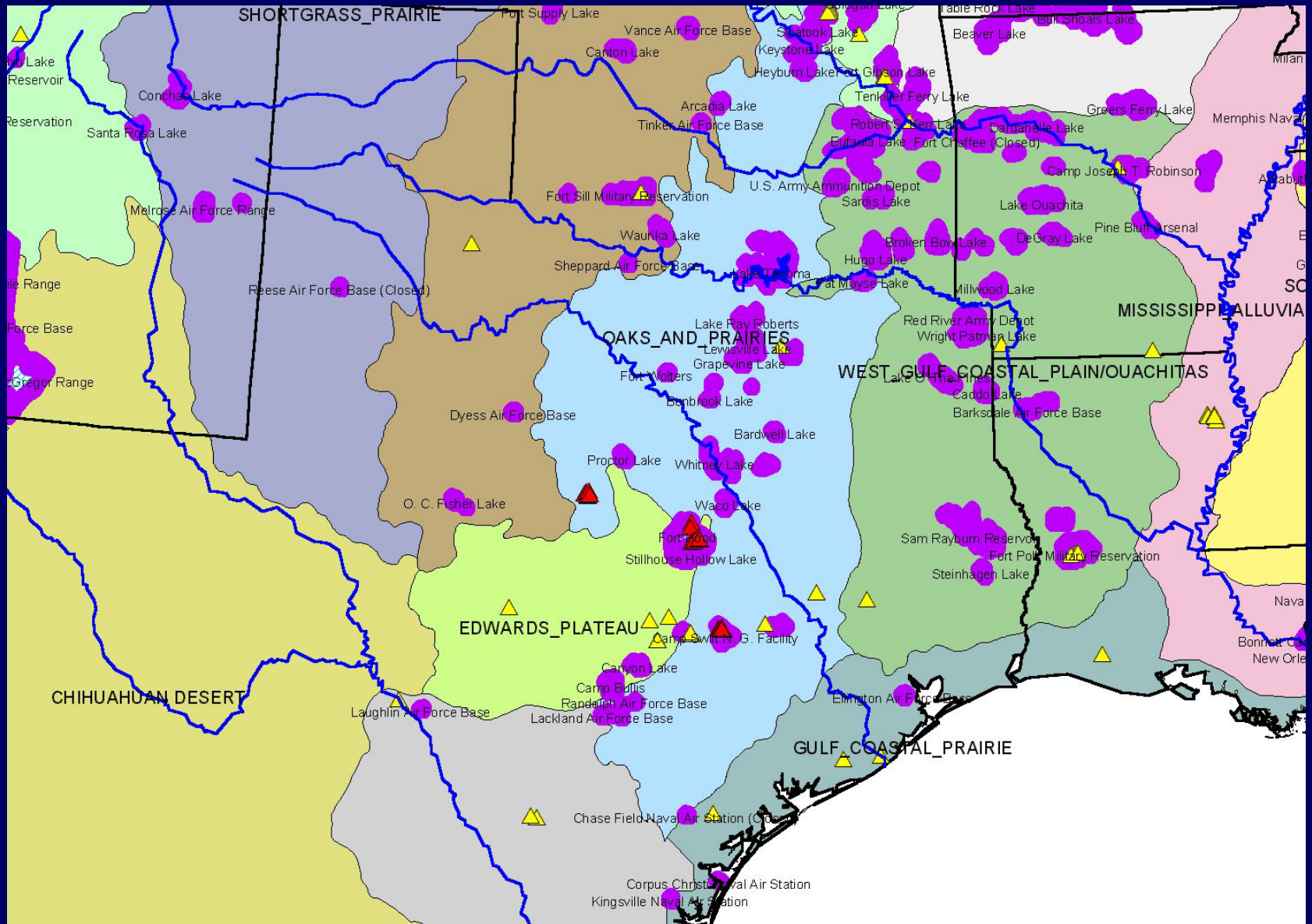
Heavily forested site

for Red-eyed Vireo, Ovenbird, Wood Thrush, and Worm-eating Warbler

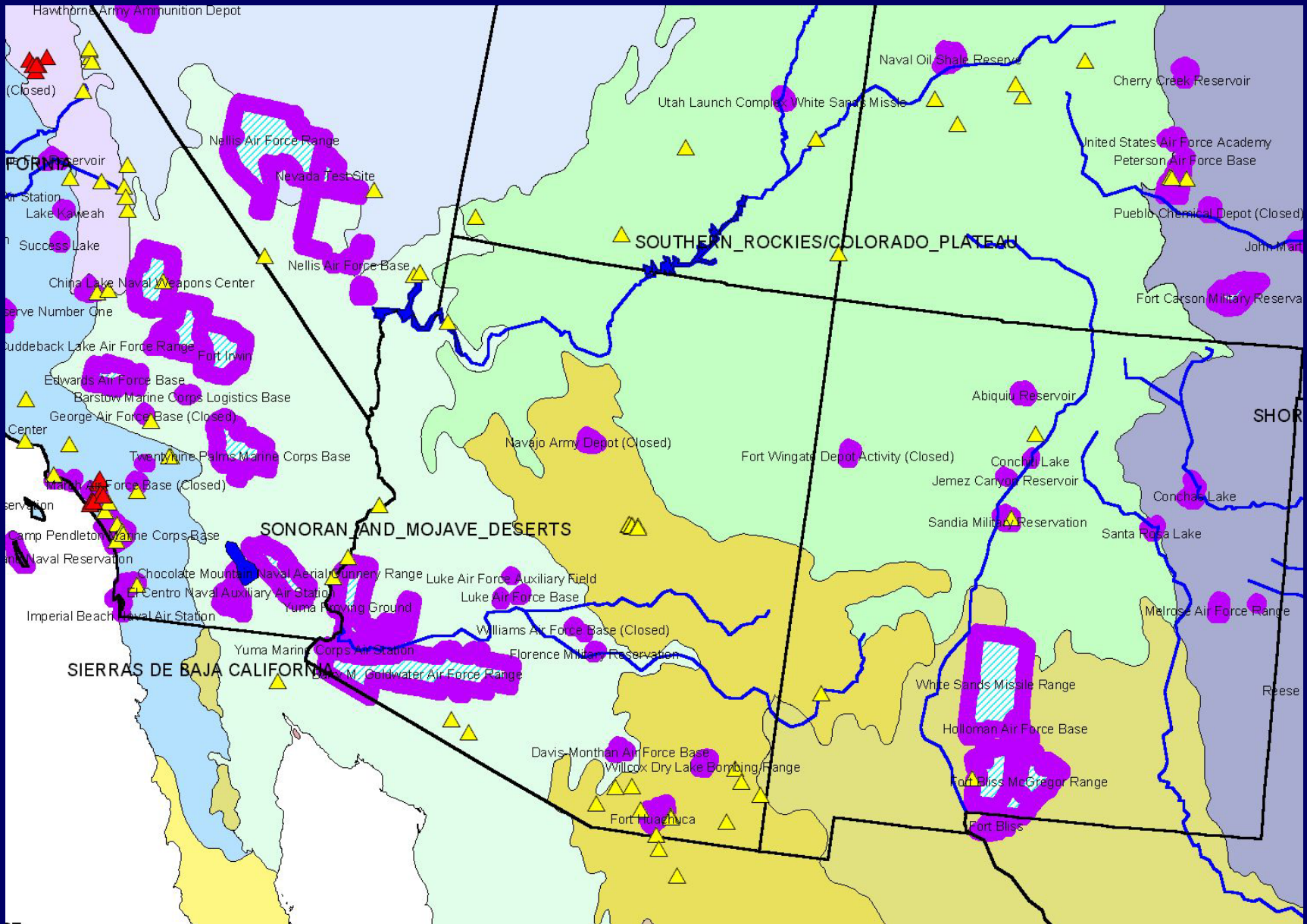
Military Lands and Bird Conservation Regions



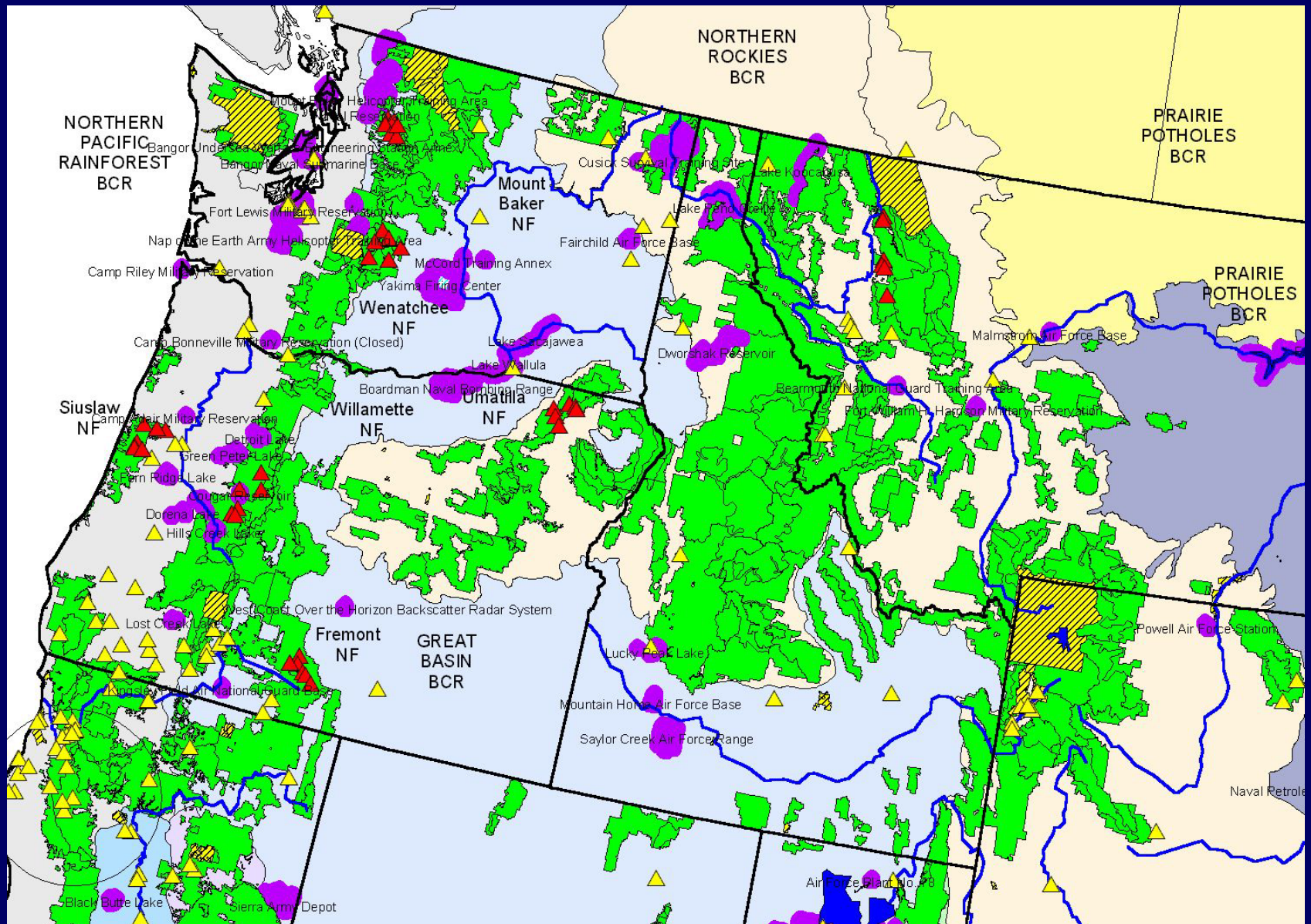
Oaks & Prairies – Edward's Plateau



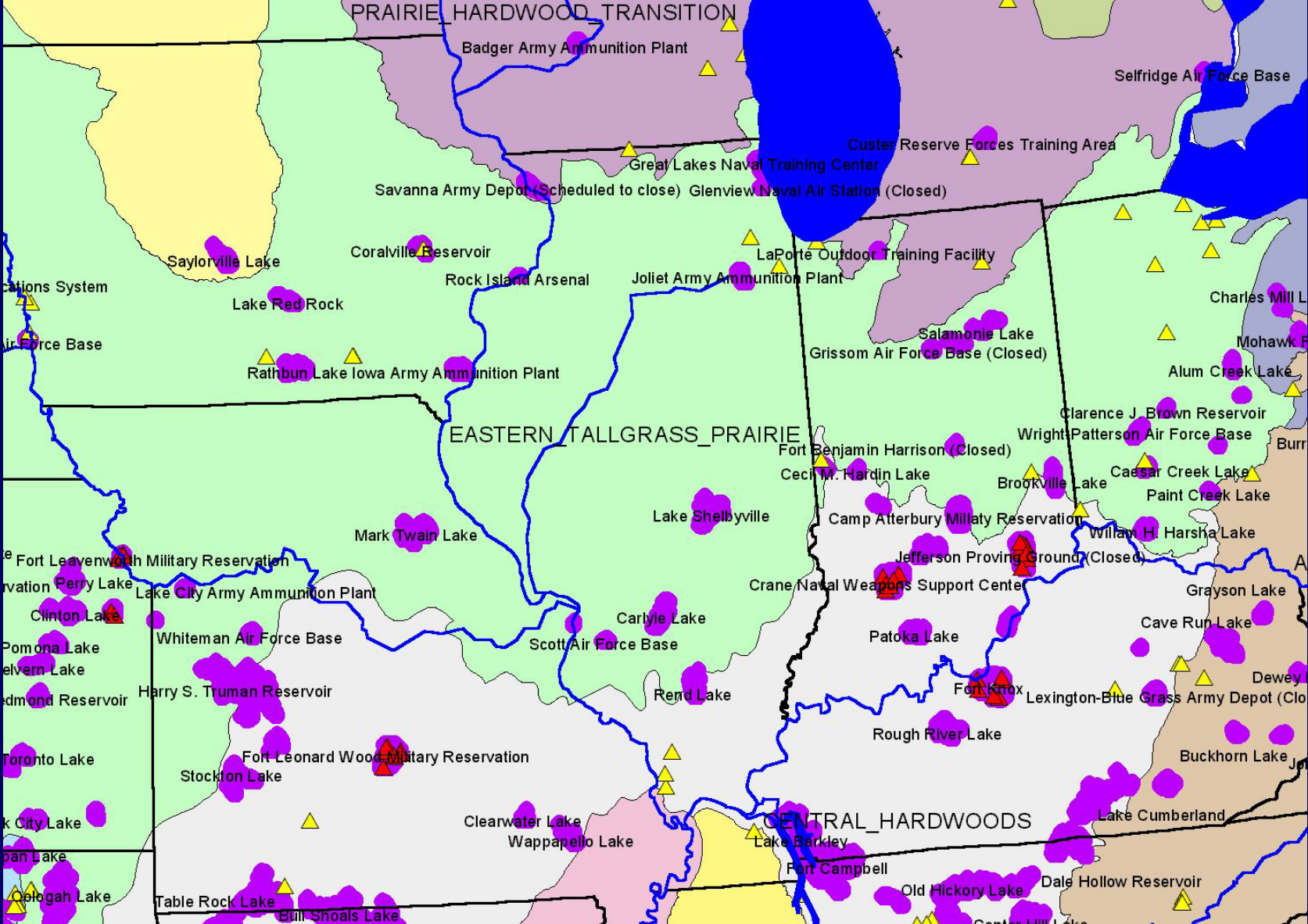
Southwestern Deserts – Stopover Habitat



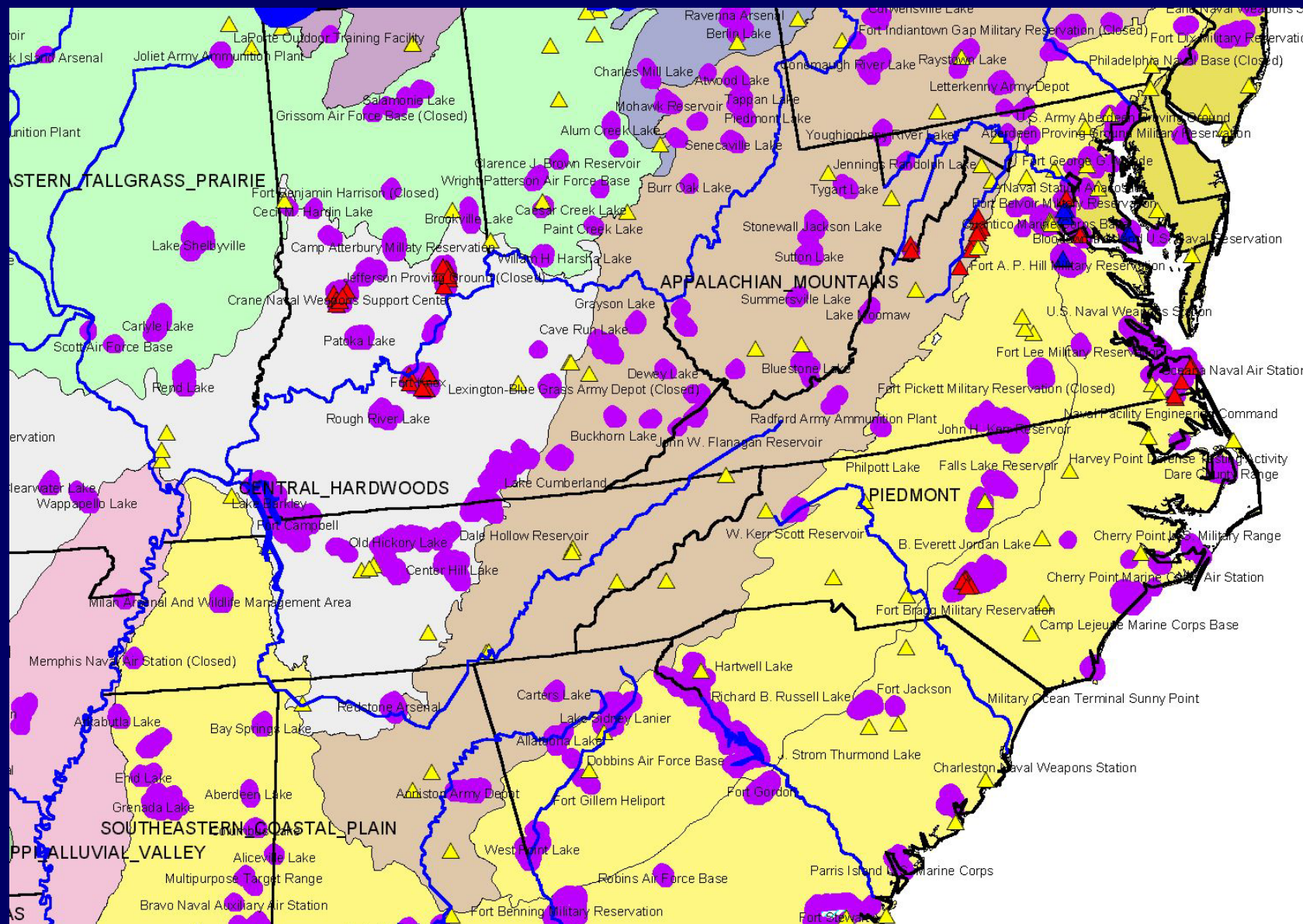
Pacific Northwest – DoD/USFS/BLM/BIA



Eastern Tallgrass Prairie – MAPS ?



Piedmont and Appalachians



Summary

- Demographic monitoring (MAPS) has produced valuable data to enable avian population modeling efforts
 - *Survival rate estimates from spatially pooled data*
 - *Estimates high or low compared to expectations*
 - *Strong links to climate/weather*
- Combining MAPS and USGS NLCD data at regional scales can provide useful land management models for Birds of Conservation Concern
 - *Requires consideration of regional trends and local influences*
- A requirement exists to construct “performance measures” based on data from surrounding region